

# Isokinetic Certification 101 Episode 6: Isotonic Control Training

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## Introduction to Isokinetic Training and Testing

Course Instructors:

John Hisamoto P.T./A.T.,C.

Daniel Bodkin PT, DPT, ATC



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- CSMi
- Daniel Bodkin PT, DPT, ATC
- Email questions to Rob:  
[Rob.potash@csmisolutions.com](mailto:Rob.potash@csmisolutions.com)



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- Register your clinic for free  
at [Cybexetest.org](http://Cybexetest.org)
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## Shout Outs

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Erik Meira PT, DPT, SCS, CSCS  
J.W. Matheson PT, DPT, MS, SCS, OCS, CSCS

CSMi Intro music provided by bensound.com

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## Discussion Topics

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### Past:

- History & Science
- Course Preview
- Mobility
- Stability
- Strength

### Present:

- Proprioceptive control and NMR using isotonic training.

### Future:

- July-Aug: Testing
- Sept-Dec: Case Studies/POC's, guests, review & wrap up

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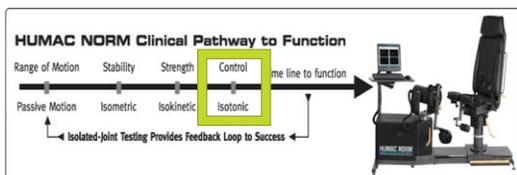
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## THE FIVE BASIC PHASES OF REHABILITATION

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**Isotonic Exercise**



Constant force / Variable velocity

Motor Control

- Three input systems to the CNS: Force, direction, and velocity.

Applications:

- Neuromuscular control / Proprioception
- Strengthening
- Endurance training
- Rate of force production

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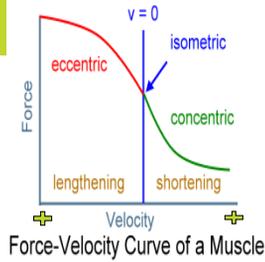
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**Order of Torque Capacity Isokinetic**

Fast Eccentric:	Highest torque capacity
Slow Eccentric:	↑
Isometric:	Medium torque capacity
Slow Concentric:	↑
Fast Concentric:	Lower torque capacity



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**Order of Torque Capacity Isotonic**

**Inverse relationship**

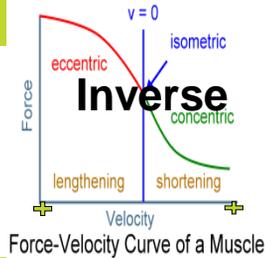
Example squats:

Rep 1:

- Fast ecc = low force generation
- Slow con = low force generation

Rep 2:

- Slow ecc = high force generation
- Fast con = high force generation



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**Order of Torque Capacity**  
**Isotonic**



**Inverse relationship**

Example squats:

Rep 1:

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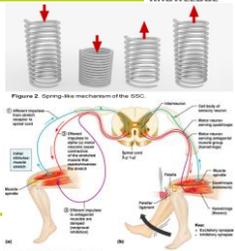
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**Dynamic Isotonic Training**



- To better facilitate NMR, you can set the eccentric load 30% greater than the concentric load.
  - Example: 10ftlbs concentric and 13ftlbs eccentric
- This will give a quick stretch inducing the stretch-shortening cycle or plyometric effect.



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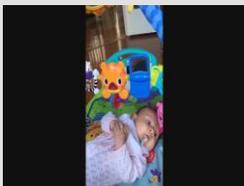
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**Proprioception/NMR Examples**



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Youtube clip can be found at: <https://www.youtube.com/watch?v=S9IKC7vb-Ts>

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Kim H. Kramer J. Effectiveness of visual feedback during isokinetic exercise. J Orthop Sports Phys Ther. 1997; 26(1):318-23.

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- Visual feedback may be advantageous during the early phase of learning where it serves to facilitate neuromuscular control and to refine motor skill training.
- Motor learning may occur more readily during eccentric muscle actions, resulting in higher torques and higher reliability.
- As a result, eccentric muscle actions performed using visual feedback may be a preferred means to learn a motor skill.
- Possible mechanisms which might explain the greater sensitivity of eccentric muscle actions to visual feedback include
  - 1) motor recruitment efficiency,
  - 2) passive parallel elasticity of muscle spindles,
  - 3) advantages of crossbridge kinetics.

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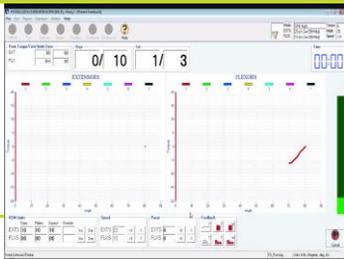
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### Pro-Active Pearls: Use the Visual Feedback

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### Recall back to E4 and E5

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**Lohse K, Shirzad N, Verster A, Hodges N, Van der Loose HF. Video games and rehabilitation: using design principles to enhance engagement in physical therapy. J Neurol Phys Ther. 2013;37(4):166-75.**



- Research suggests that video games are beneficial for cognitive and motor skill learning in both rehabilitation science and experimental studies with healthy subjects.
- Physiological data suggest that gameplay can induce neuroplastic reorganization that leads to long-term retention and transfer of skill; however, more clinical research in this area is needed.
- There is interdisciplinary evidence suggesting that key factors in game design, including choice, reward, and goals, lead to increased motivation and engagement.

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## John-isms Drinking Game



- "from that stand-point/perspective" = 1 drink
- "we need to pay attention to" = 1 drink
- Random story (humuhumunukunua'ia) = 2 drinks
- "boom-boom-boom" = Finish it!



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**Giggins O, McCarthy Persson U, Caulfield B. Biofeedback in rehabilitation. Journal of NeuroEngineering and Rehabilitation 2013;10:60.**



- Measurements of movement, postural control and force output can be made using a number of different devices and used to deliver biomechanical biofeedback.
- Inertial based sensing biofeedback is the most widely researched biomechanical biofeedback method, with a number of studies showing it to be effective in improving measures of balance in a number of populations.



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Giggins O, McCarthy Persson U, Caulfield B. Biofeedback in rehabilitation. *Journal of NeuroEngineering and Rehabilitation* 2013;10:60.

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- Other types of biomechanical biofeedback include force plate systems, electrogoniometry, pressure biofeedback and camera based systems however the evidence for these is limited.
- Biofeedback is generally delivered using visual displays, acoustic or haptic signals, however more recently virtual reality (VR) or exergaming technology have been used as biofeedback signals.



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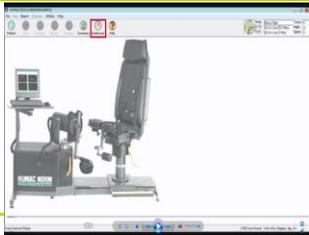
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### Isotonic exercise Set-up

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### Standard Isotonics

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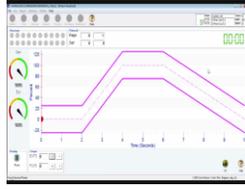
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### Pacing and Roadway

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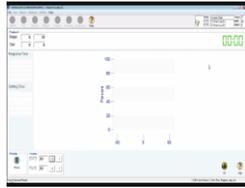
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### Priception Training and Response Time

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### Interactive Path / Line

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Games

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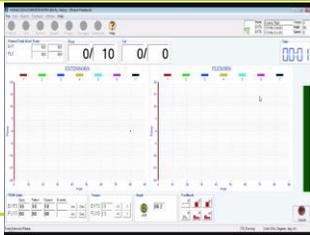
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Questions/Answers

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"Always pass on what you have learned"

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2. Proffen B.L., Murray M.M. (2013) Reinnervation and Revascularization in Engineered ACL Healing. In: Murray M., Vavken P., Fleming B. (eds) The ACL Handbook. Springer, New York, NY
3. Cooper RL, Taylor NF, Feller JA. A systematic review of the effect of proprioceptive and balance exercises on people with an injured or reconstructed anterior cruciate ligament. Res Sports Med. 2005;13(2):163-76
4. Kim H, Kramer J. Effectiveness of visual feedback during isokinetic exercise. J Orthop Sports Phys Ther. 1997; 26(6):318-23.
5. Lohse K, Shirzad N, Verster A, Hodges N, Van der Loose HF. Video games and rehabilitation: using design principles to enhance engagement in physical therapy. J Neural Phys Ther. 2013;37(4):166-75.
6. Giggins O, McCarthy Persson U, Caulfield B. Biofeedback in rehabilitation. Journal of NeuroEngineering and Rehabilitation 2013;10:60.

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## Other References



- Music Provided by Bensound.com
- <https://www.youtube.com/watch?v=S9iKc7YD-1s>
- <https://images.app.goo.gl/2gfnvwJH8RXrS9i36>
- <https://images.app.goo.gl/1dar9CwKzoyePcFC7>
- <https://images.app.goo.gl/wB3RkIvXt4kD62DL9>
- <https://images.app.goo.gl/kuq1D93snqTFns929>
- <https://images.app.goo.gl/1Kk5HqP-HnsKc-1V8>

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